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Tonal Polarity in Konni Nouns: An Optimal Theoretical Account*

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1. Introduction

Tonal polarity is a phenomenon in which a tone-bearing unit, often in an affix, shows a tonal value opposite to that immediately adjacent to it. When the term "opposite" is used, of course, this assumes a binary contrast in tonal qualities, i.e. a contrast between only High and Low tones. Indeed, to my knowledge, the only cases in which tonal polarity has been discussed in the literature are two-tone systems. These include Margi (Hoffman 1963, Pulleyblank 1983, 1986), Bambara (Dwyer 1976, Creissels & Grégoire 1993), Moore and Lama (Kenstowicz, Nikiema, & Ourso 1988), Dagbani (Hyman 1993), Dagaare (Antilla & Bodomo 1996, forthcoming), and Hausa (Newman 1995). Schuh (1978) also mentions Ngizim, Igbo, and Hausa examples of tonal polarity. Though Chumbow (1982) speaks of "polarization" in the three-tone system of Ogori, it is not clear that this is in fact tonal polarity rather than some other process.[1]

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[1] For discussion of historical processes leading to synchronic tonal polarity, see Hyman & Schuh (1974).

In the SPE framework, polarity rules were handled with alpha notation. In a tonal context, this would imply a rule something like the following.

(1) $T \rightarrow -\alpha T / \alpha T \_\_$

This is interpreted as "a tone becomes the opposite of the value of the preceding tone" and is the way Schuh (1978) accounts for polarity. However, in an autosegmental framework, this type of rule is an anomaly, as Kenstowicz, Nikiema & Ourso (1988) point out; the usual autosegmental operations are spreading, delinking, or deleting tones. There is no way to change a tone into the opposite of an adjacent tone in one step while utilizing the usual range of autosegmental operations. Thus Kenstowicz *et al* (1988) analyzed surface polarity in Moore and Lama not as true polarity, but as a surface dissimilation of High tones (HH → HL). However, a dissimilation of this sort still is anomalous in terms of the above autosegmental operations, unless it is a shorthand notation for deleting a High and inserting Low by default, as indeed Pulleyblank 1983, 1986 does for Margi. With the deletion/default option in place, the notion of "polarity" is reduced to an epiphenomenon rather than a true process in most of the literature cited above (with the exception of Hoffman, who notes the phenomenon but does not attempt a formal analysis, and Newman, who strongly argues that the notion of polarity is a natural one cross-linguistically and should not be ruled out on the basis of a particular phonological model).

The framework of Optimality Theory is more amenable to the phenomenon of tonal polarity. Possible outputs are scanned for violations of surface-true constraints, and if, as we shall see, there is a generalization that a suffix is opposite in tone to the preceding syllable, then a constraint may be formulated to express this fact of the language. Since Optimality Theory is a non-derivational model, it is not concerned with any mechanics of possible intermediates between underlying and surface forms.

In this paper, I present an Optimality Theory analysis of a polar-toned suffix in Kɔnni nouns, for which previous analyses of polarity in terms of a general OCP-driven dissimilation is not tenable. Kɔnni is a Gur language, Central Oti-Volta branch, spoken in the Northern Region of Ghana by about 2500 people. Due not only to the number of speakers, but also the isolation of its villages, the language is still largely unknown even to most Ghanaians. Data is taken from my field notes in the village of Yikpabongo from 1986-1992. Some of the material is also found in Cahill (1992).

The basic phenomenon is that the Noun Class 1 plural suffix *-a/-e* in Kɔnni has a tone opposite to what the previous stem tone is. Thus below, while all the singular forms of the nouns end in a High tone due to the suffix *-ŋ́*, the plurals end either with High or Low, whichever is opposite to the preceding stem tone.

(2)

singular	plural	stem tone	pl.suffix tone	gloss
tǎŋ	tàná	L	H	stone(es)
síŋ	síà	H	L	fish(es) (sp.)
bʼìsíŋ	bʼìsá	L	H	breast(s)
tígíŋ	tígè	H	L	house(s)
sʼìkpááŋ	sʼìkpárà	LH	L	heart(s)

This phenomenon is limited to Noun Class 1 plural suffixes. All other suffixes are unambiguously High-toned, and a general OCP-driven solution of the Moore/Lama type will not work for Kɔnni. However, an Optimality Theory analysis using a constraint POLAR will be seen to work very naturally. In order to lay the foundation for analysis of the polar-toned phenomenon, the broader tonal system of Kɔnni must first be examined. This is especially necessary since most of the previous work published on tone in Optimality Theory has been on Bantu languages, which have quite different tonal characteristics than Kɔnni.

This study is organized as follows. The remainder of this section will lay out basic theoretical assumptions and observations about tones in Kɔnni. Section 2 will go into some detail as to reasons for choosing the underlying representations used in the remainder of the paper, including High tones on suffixes, the floating High associative morpheme, justification of a floating Low tone in downstep, and the existence of toneless noun stems. Section 3 is the analysis in terms of Optimality Theory, first reviewing the necessary constraints, and then analyzing in some detail the polar-toned plural suffix of Noun Class 1. Finally, in Section 4, I summarize the constraints and conclude. Two Appendices of data are also included.

An autosegmental representation of tones is assumed in this work, as in Goldsmith (1976) and the extensive literature arising from it . A detailed representation of tonal features such as [±raised, ±upper] (e.g. Pulleyblank 1986), or the representation of pitch register and pitch height on separate tiers (e.g. Snider 1990) is not necessary for our purposes here. While the Kɔnni analysis is translatable into such systems, these extra enrichments of representation would not be illuminating, and the tones will be abbreviated simply as H for High tone and L for Low tone.

The version of OT that will be assumed is that of Correspondence Theory (McCarthy & Prince 1995), in which various MAX and DEP constraints compare input and output and penalize differences between the two.

Transcriptions of segmental material will be phonemic. Such a transcription is very close to phonetic, with the exception of backing of front vowels before the velar nasal (e.g. /i/ → [ɨ], /e/ → [ə]), reduction of vowels before liquids, and weakening of /g/ to [ɣ] intervocalically. Long vowels are transcribed as sequences of two identical vowels.

Kɔnni has three phonological surface tones: High (á), Low (à), and downstepped High (ꜜá), . These can combine to form one rising tone (low to high) and two falling tones (high to low and high to downstepped high). In transcriptions, downstep will be indicated by ꜜ before the next High tone. These are illustrated below.

(3) [kpááŋ] 'oil' H
[kpàáŋ] 'back of head' LH
[kpáꜜáŋ] 'guinea fowl' HꜜH

The following generalizations may be made about the Kɔnni tone system:

(4) Generalizations about Kɔnni tone:
a) The syllable is the tone-bearing unit.
b) There is no HLH sequence phonetically within a word, and only rarely across words.
c) Contour tones are found only on the last syllable of a word.
d) A contour in Kɔnni has a maximum of two pitch levels, H-L, L-H, or H-ꜜH, i.e. a maximum of two tones associated to a TBU.
e) Underlying High tones do not remain floating, but Low tones can float between Highs, causing downstep.
f) High tones always remain associated to the TBU that sponsors them.

Crucial to the approach employed here is the view that a downstepped high tone after a normal high is the phonetic result of a floating low tone between the two high tones (see Sec. 2.3). So a sequence transcribed as HꜜH is taken to reflect an underlying tone pattern of HLH.

2. Underlying Representations

Standard Optimality Theory deals with inputs and outputs, with various constraints mediating between the two. In this, OT differs from derivational rule-based approaches, which may have several relevant levels at which different rules may apply. In this section, before proceeding to the interaction of constraints in an OT analysis of Kɔnni nouns, I will justify the inputs assumed in following sections.

The notion of "sponsor" will be important in the sections below. We will define the sponsor of a tone as the segmental part of the morpheme that co-occurs with that tone in the lexicon. At this point I am taking no position on whether tones are pre-linked to TBU's in the lexicon; for simplicity in displays they are not indicated as pre-linked.

2.1 High-toned nominal suffixes

The table below contains examples of all attested tone patterns and syllable weights by noun class that I have to date. The classes are defined by what forms of the articles and plurals they take. The most striking generalization to be noted is that an overwhelming majority of nouns, whether singulars or plurals, definite or indefinite, end with a High tone, (the exceptions are some plurals in Classes 1 and 3, and a very few singulars in Class 3).[2]

(5) Nouns	Singular	Sg.+ Art	Plural	Pl.+ Art	Stem tone
Noun Class 1	/-ŋ́/	/-rí/	/-a/	/-a-há/	
stone	tǎŋ	tànní [3]	tàná	tànáhá	L
face mark	wíŋ	wínní	wìè	wíé!hé	H
chest	nyúúŋ	nyúúrí	nyúrà	nyú!ráhá[4]	H
nail	yí!íŋ	yíí!rí	yíímà	yíí!máhá	HL
bee	síébiŋ	síébírí	síébíè	síébié!hé	HH
breast	bìɪsíŋ	bìɪsìrí	bìɪsá	bìɪsáhá	L
bag	búllɔ́gíŋ	búllɔ́gírí	búllɔ́gà	búllɔ́!gáhá	HH
stump	dààgbúgíŋ	dààgbúgírí	dààgbúgê	dààgbúgé!hé	LHH
Noun Class 2	/-ŋ́/	/-kú/	/-tí/	/-tí-tí/	
courtyard	gbàáŋ	gbàákú	gbàátí	gbàátítí	L
path	síéŋ	síékú	síétí	síétí	H
squirrel	chí!íŋ	chíí!kú	chíí!tí	chíí!títí	HL
hawk	kpíí!líŋ	kpíí!líkú	kpíí!lítí	kpíí!lítítí	HL

[2] No attempt has been made to integrate the Kɔnni noun classes into the larger picture of Niger-Congo; thus the numbering of these classes is arbitrary. Variations in vowel quality of the suffixes (i/ɪ, u/ʊ, a/e) are the result of root-controlled vowel harmony (see Cahill 1996 for details).

[3] The /-ri/ suffix assimilates to a nasal-final noun stem as /-ni/.

[4] The shortening of a root-final vowel in the plural occurs with non-front vowels and is accompanied by the insertion of -r- before the normal suffix. A complete discussion of this is beyond the scope of this paper.

Noun Class 3	/-ŋ́/	/-ká/	/-sí/	/-sí-sí/	
person	vúóŋ	vúóké	vúósí	vúósísí	H
dawadawa	dùúŋ	dùùká	dùùsí	dùùsísí	L
axe	lí!áŋ	líá!ká	líásî	líá!sísí	HL
man	dèmbíŋ	dèmbìké	dèmbìsí	dèmbìsísí	L
fly	nánjúŋ	nánjúká	nánjúsí	nánjúsísí	HH
headpan	tá!síŋ	tásí!ká	tásísî	tásí!sísí	HL
lizard	gòrá!áŋ	gòráá!ká	gòráá!sí	gòráá!sísí	LHL
hat	síbúbúŋ	síbúbúké	síbúbúsí	síbúbúsísí	HHH
mussel	kálâŋgbí!áŋ	kálâŋgbíá!ká	--	--	HHHL
bowl	kúrúbâ	kúrúbá!ká	kúrúbá!sí	kúrúbá!sísí	HHHL

Noun Class 4	/-ŋ́/	/-bú/	/-tí/	/-tí-tí/	
water	nyááŋ	nyáábú	nyáátí	nyáátítí	H
meat	nɔ̀ŋ	nɔ̀mbú	nɔ̀ntí	nɔ̀ntítí	L
sleep	gbí!íŋ	gbíí!bú	gbíí!tí	gbíí!títí	HL
peanut	sìŋkpááŋ	sìŋkpáábú	sìŋkpáátí	sìŋkpáátítí	LH
ash	tányéé!líŋ	tányéé!líbú			HHL

Noun Class 5	/-Ø/	/-wá/	irreg.	irreg.	
child	bùá	bùàwá	bàllí	bàllílí	L
woman	hɔ̀gú	hɔ̀wwá	hùáŋ	hùàbá	L
thief	gáárú	gáárúwá			H
older sibling	mîì	míí!wá	míí!líŋ	míílí!bá	HL

A credible hypothesis, then, is that all the suffixes (*except* for the plurals [-a/-e] in Noun Class 1) are lexically High-toned. These will include the singular indefinite suffix /-ŋ/, the singular definite suffixes /-ri/, /-ka/, /-ku/, /-bu/, /-wa/, the plural suffixes /-ha/, /-ti/, /-si/, /-ba/, and the plural markers /-ti/, /-si/, /-ba/. The only singular indefinite nouns which end in a Low tone lack the *-ŋ* suffix; apart from the unusual *kúrúbâ* in noun class 3, these are all from noun class 5 (see forms in Appendices 1-2). The plural suffixes of class 1, which manifest a tone opposite to the previous stem tone, will be examined below in Sec. 3.4, but all the other noun suffixes have a High tone lexically.[5]

[5] There are a few plural forms in noun class 3 ending in *-si* which are not High; at this point the reasons are not understood.

2.2 Floating High tone associative morpheme

Though the main point of the paper is not floating High associative tones, I discuss them here in order to later demonstrate constraints on floating tones vs. associated ones, and the reality and source of floating Lows in downstep.

The morpheme which marks the associative construction in third person, as in 'his stone' or 'child's stick' is posited to be a segmentless High tone. The evidence for this is that the head noun of every such construction for third person as possessor has a High tone on its initial syllable. It is only the third person, singular or plural, that has the floating High tone as associative marker:

(6)		1st	2nd	3rd	3rd non-human	
	singular	ǹ dàáŋ	fǐ dàáŋ	ù dá!áŋ	kà dá!áŋ	'my, *etc.* stick'
	plural	tǐ dàáŋ	nǐ dàáŋ	bà dá!áŋ	à dá!áŋ	

If the head noun already has a High tone on its first syllable in citation form, then there is no change when it is placed in an associative construction. Examples in which the tone of the noun does change are given below with both pronouns and nouns as possessors. The examples in (7a) are repeated in Appendix 1.

(7) a.	tǎŋ	ù tá!ŋ́	'stone, his stone'
	kàgbá	ù kágbà	'hat, his hat'
	dàmpàlá	ù dám!pálá	'bench, his bench'

b.	bùàwá dá!áŋ	'child's stick'	(cf. bùàwá 'the child', dàáŋ 'stick')
	bùá kárénťìà	'child's cutlass'	(cf. bùá 'child', kàrénťìà 'cutlass')
	chòrú dám!pálá	'husband's bench'	(cf. chòrú 'husband', dàmpàlá 'bench')

The alternation between the initial Low for head nouns in citation form and the initial High in the associative construction is explained by the existence of a High tone between the two nouns (comparable to the *'s* in English 'child's stick'). The High will dock to the head noun, giving the observed pattern of a High tone on the first syllable (sometimes as part of a H!H contour on that syllable, as in *tá!ŋ́* and *dá!áŋ* above).

2.3 Downstep as floating Low tone

In some languages, e.g. KiShambaa (Odden 1982) and Supyire (Carlson 1983), downstep can be shown to be the result of conjoining two High tones. In these languages, two morphemes which are independently known to have High tones, when abutted, are

phonetically H!H. However, in other languages (e.g. Akan in Cahill 1985 and Venda in Kenstowicz 1994, *inter alia*), a downstep is the result of a Low tone floating between two linked Highs. Kɔnni is of the latter type, as will be demonstrated here.

Consider the forms:

(8) wíŋ	wíè	'face mark, face marks'	
tăŋ	ὺ tá!ŋ́	'stone, his stone'	(tá!ŋ́ is H!H on a single syllable)

As argued in 2.1, the *-ŋ* singular suffix has a lexical High tone. The form *wíè* 'face marks' shows that the root *wi* sponsors a High tone, with the Low of the HL fall coming from the polar suffix *-e* (discussed in Sec. 3.4). Thus both the root *wi* and the suffix *-ŋ* have High tones. Their concatenation brings these two Highs together. If downstep was the result of bringing two Highs together, we would expect a H!H pattern *wí!ŋ́* on the singular. However, the correct form is *wíŋ*, with a level High tone. That a H!H pattern is indeed possible on a single TBU is shown by the existence of forms like *ὺ tá!ŋ́* 'his stone.' Thus downstep is not the result of concatenation of High tones.

More positively, *ὺ tá!ŋ́* shows that the presence of a floating Low tone creates downstep. As established in 2.2, third person possessives such as this are marked by a floating High tone which associates to the head noun, on the right. Thus all head nouns in this construction begin with a High tone. However, the citation form *tăŋ* has a LH sequence. When the preceding associative High is added, the result is a H!H contour on the syllable. Thus a Low tone is necessary between Highs to produce downstep:

(9) a. L H b. L H L H → L H L H

\/ | \/ | \ /

taŋ ʊ taŋ ʊ taŋ

This is also seen in the case of the downstep created by the addition of a definite article to a noun ending with a Low tone. Quite a few plurals in Noun Class 1 end in Low tones, and when the definite suffix *-há* is added, the result is a downstepped High on the last syllable. There are also a few singulars which do the same:

(10) a. nyúrà	nyú!ráhá	'chests, the chests' (class 1)
b. kúrúbâ	kúrúbá!ká	'cooking pot, the cooking pot' (class 3)

The representations for 'chests, the chests' is given below. The Low that is present and associated in 'chests' is still present but floating in 'the chests, ' a result of spreading explained in Sec. 3.2.

(11)

H L	H L H
| |	| / |
nyʊ ra	nyʊ ra ha

With this background, we can see that a word like *kpá!áŋ* 'guinea fowl' is represented as having an underlying HLH tone pattern, with the Low floating and causing downstep. Further examples will be seen as we progress through the paper.

2.4 Toneless noun stems

Since some of the nouns with polar suffixes to be discussed later have toneless stems, I justify their tonelessness at this point.

Two-syllable nouns in Kɔnni illustrate a variety of tonal patterns when placed in various contexts. Especially notable is that nouns which have the same LH surface tones in citation form behave quite differently in different tonal environments. If underlying High and Low tones were mapped one-to-one onto syllables, there would be of course only four possible tone patterns: HH, HL, LH, LL. However, the real situation is more complex; there are at least eight actual tonal behaviors of disyllabic nouns. Much of the complexity comes from the fact that some of these nouns have toneless stems and/or no suffix in singular form.

Consider data with four disyllabic nouns below, repeated in Appendix 1, which all have the same LH tonal pattern in citation form but show different behavior in different tonal contexts. The postulated underlying tones of the root plus suffix are displayed in the left column.

(12)

	UR	citation	'one X'	'his X'
a. 'fish'	LH	zàsíŋ	zàsíŋ !káání	ù zá!síŋ
b. 'louse'	ØH	kpìbíŋ	kpìbíŋ !káání	ù kpíbíŋ
c. 'hat'	LØ	kàgbá	kàgbà kàání	ù kágbà
d. 'woman'	ØØ	hɔ̀gú	hɔ̀gú !káání	ù hɔ́gù

Though all nouns have the same tone pattern in citation form, (12c) 'hat' is differentiated in the forms 'one X' from the others. The last column, 'his X,' distinguishes the other three from each other.

Note that the nouns of (12a-b) end in *-ŋ*, as do approximately 90% of Kɔnni nouns. This *-ŋ* contributes the High tone of the second syllable. In contrast, the nouns in (12c-d) end in a vowel, and I therefore posit that these have no tone lexically on the second syllable. The other dichotomy comes between (12a,c), which I analyze as having a

lexical Low tone contributed by the root, and (12b,d) which I propose have a toneless root.[6]

The pattern for *zasɪŋ* 'fish' is exactly as we would expect for a noun with LH present lexically. The downstep in the 'his X' column is placed as expected, between the High of the suffix and the High of the first syllable that come from the associative morpheme. But for *kpibiŋ* 'louse,' there is no downstep in the 'his X' column as would be expected if there were a lexical Low tone. The conclusion is that the Low which shows up in citation form is not present in UR.

The nouns 'hat' and 'woman' have no *-ŋ* suffix and so any High in forms of these words cannot be the contribution of the suffix. If there were a lexical High as part of the root, it would show up consistently in the same position in the word, similar to the Highs in *máásà* 'a cake' or *tá'síŋ* 'headpan.' Instead, a High tone shows up in different positions in these words, and not at all in 'one hat.' As I will discuss below, the High tone in the nouns for which there is no lexical High is the result of a phrasal constraint inserting a High. The lack of a lexical High in 'hat' and 'woman' explains why there is only one High, on the initial syllable of the noun, in 'his hat, his woman.' The High comes from the floating High associative marker, and that is the only High in these phrases.

The basic tone patterns of singular disyllabic nouns, then, fall into a pattern based on whether their stem is High, Low, or toneless, and whether or not they have the common High-toned *-ŋ* singular suffix:

(13)	with *-ŋ* (H)		without *-ŋ* (Ø)	
stem H	HH jɔ́rɔ́ŋ	'ladder'	HØ máásà	'a cake'
stem L	LH zàsíŋ	'fish'	LØ kàgbá	'hat'
stem Ø	ØH kpibíŋ	'louse'	ØØ hɔ̀gú	'woman'

Other disyllabic tone patterns, such as for *tá'síŋ* 'headpan' and *nɪ̀mbʊ́à* 'sibling' involve more than one lexical tone in the noun stem.

2.5 The OCP and Kɔnni

In words such as *jɔ́rɔ́ŋ* 'ladder' in (13) above, I have indicated tones as HH without comment. However, in the absence of a process by which HH is pronounced with

[6] The related Gur languages Moore and Dagaare have also been analyzed as having the cognate of the noun stem of 'woman' as underlyingly toneless. For Moore, the cognate word is *págá* (Kenstowicz, Nikiema & Ourso 1988), and for Dagaare it is *pʋ́gʋ́* (Antilla & Bodomo ms.) With the limited data in both these articles and my Kɔnni data, it has not been possible to identify any toneless cognates corresponding to the Kɔnni 'louse' class of words.

a downstep between the Highs, there would be no phonetic difference between two distinct High tones and one High multiply associated to the two syllables. In some languages, sequences of two identical tones are not allowed, and they either merge, as in HH → H, or one dissimilates, as in the Meeusen's Rule HH → HL, or a downstep (possibly a floating Low) is realized between them. However, in Kɔnni, the OCP is not active with respect to tones. We can see cases in which sequences of both LL and HH must be allowed.

For High tones, consider the case of *jágâ* 'shades' and *mʊ́gà* 'rivers.' Both are representative of several words, i.e. neither is a unique case, and both have the tonally "polar" plural suffix *-a*, to be further discussed in Sec. 3.4, which in both of these words inserts a Low tone, since the previous tone is High. The question, of course, is how to explain the difference between the final Low tone in *mʊ́gà* and the final falling tone in *jágâ*. The fall cannot be the result of a spreading process, since it does not occur in *mʊ́gà*. The solution is that *jágâ* has two adjacent High tones in underlying representation, and *mʊ́gà* has one:

(14)

H H L	H L
| |/	| |
ja ga	mʊ ga

The word *dàmpàlá* 'bench' (lit. 'logs'), contrasted with *bʊ̀rʊ̀míŋ* 'bush donkey' shows the difference between words with a single multiply-linked Low and two adjacent Lows. When *dàmpàlá* and *bʊ̀rʊ̀míŋ* have a High-toned word preceding, the tonal behavior differs:

(15)

dàmpàlá	ŋ̀ wó dàmpàlá	'bench, I lack bench'
bʊ̀rʊ̀míŋ	ŋ̀ wó ꜜbʊ́rímíŋ	'donkey, I lack donkey'

As illustrated in (10a) and (11), a HLH underlying tone on a trisyllabic word is realized as HꜜHH on the surface. A single Low between Highs is always floating, resulting in downstep. However, if more than one Low is present between Highs, then they are associated and pronounced as Low. My claim is that the difference in tonal behavior between *dàmpàlá* and *bʊ̀rʊ̀míŋ* is the result of the presence of two lexical Low tones versus one:

(16)

a. L L H	H L L H	b. L H	H L H
| | |	| | | |	/| |	| /|\
dampala	wo dampala	burimiŋ	wo burimiŋ

Since identical adjacent tones may exist for both High and Low tones, it is evident that the OCP cannot be a highly ranked constraint in Kɔnni. As far as known, the OCP is

never active in Kɔnni, and it is never necessary to invoke it to explain tonal phenomena in Kɔnni.

3. Optimality Theory and Tone in Kɔnni

Investigation of the nature of tonal constraints is still in its infancy, especially since, as previously mentioned, most of the OT investigations of tone are on Bantu languages, which have quite different tonal characteristics than Kwa or Gur languages, for example. For this reason, I will adopt a somewhat conservative approach in proposing constraints in this work. For the most part, the constraints proposed here will either be parallel to well-established input-output constraints, such as those of the MAX and DEP family, or closely tied to surface-true generalizations about Kɔnni and other tone languages. In this section I will discuss how different constraints interact to give the surface forms of Kɔnni nouns.

3.1 Basic constraints

From the beginning of autosegmental theory (Goldsmith 1976), it was seen that the optimal configuration, or at least the starting configuration in a derivational framework, was that there was one tonal autosegment associated to one TBU. It was when there were more tones than TBU's, more TBU's than tones, or some language-specific spreading rule, that this pattern was violated. But the one-to-one mapping of tones to TBU's is a general constraint on languages, one which is often violated, to be sure, but which is the general default case. The following constraints, taken from Antilla & Bodomo (1997), give the results of this mapping; let us consider them as a starting point.

(17) a. 1 TONE/TBU - every TBU is linked to exactly one tone (= *CONTOUR,[7] *TONELESS)

b. 1 TBU/TONE - every tone is linked to exactly one TBU (= *FLOAT, *SPREAD)

In the case where both constraints are completely satisfied, there is one tone for every TBU, and one TBU for every tone, i.e. a one-to-one mapping of tones and TBU's.

Each of these general constraints may be violated in two ways, a consequence of the term "exactly" having two parts to its interpretation, that is, "exactly" has the parts "at least" and "not more than." Thus if two tones are linked to a single TBU, then 1TONE/TBU is violated by this *contour* tone. In complementary fashion, if there is a TBU which is not linked to any tone, then 1TONE/TBU is violated by this *toneless* TBU. Similarly, if a tone is not linked to a TBU, 1TBU/TONE is violated by this *floating* tone, symbolized as (T). Finally, if a tone is linked to more than one TBU, 1TBU/TONE is violated by the *multiply-linked* tone.

[7] A constraint prohibiting contour tones was also proposed in Bradshaw 1995.

For a given language, it is an empirical question if the functions need to be separated into their components, or whether the more general constraints of (17) are sufficient. Antilla & Bodomo do not separate the functions of (17a,b) for Dagaare, but leave open the possibility that it may be necessary in some situations. In several languages it can be demonstrated that these functions act separately, where a language exhibits one of the pairs of behavior but not the other. For example, Shona disallows floating tones but has extensive tone spreading (Odden 1981, Myers 1987), Kikerewe has toneless syllables but no contours, and Kenyang has contours but no toneless syllables (Odden, pc). As we will see below, it is also necessary to separate these functions in Kɔnni, and *CONTOUR, *TONELESS, *SPREAD, and *FLOAT (= *(T)), are the actual constraints.

There is, however, an additional distinction to be made with respect to *(T) and *SPREAD. Since their referent are tones, there is a potential distinction between High and Low tones in these constraints, and this distinction will turn out to be relevant. So (17b) is actually a family of constraints:

(18) *(T) ⇒ *(H), *(L)
*SPREAD ⇒ *HSPREAD, *LSPREAD

The distinction is crucial, as we shall see. In Kɔnni, high tones spread, but Low tones do not. Low tones can remain floating, but High tones can not. From our start in (17), then, we have the following constraints:

(19) a. *CONTOUR - every TBU is linked to not more than one tone
b. *TONELESS - every TBU is linked to at least one tone
c. *(H) - every High tone is linked to at least one TBU
d. *(L) - every Low tone is linked to at least one TBU
e. *HSPREAD - every High tone is linked to not more than one TBU
f. *LSPREAD - every Low tone is linked to not more than one TBU

In this paper, *CONTOUR, *TONELESS, *(H), and *HSPREAD will play a role in the discussion to follow, though I will not discuss details of their rankings here (for justification of the undominated ranking of *(H) as well as further details on these constraints, see Cahill (1997)).

Before our first tableau, we must consider another constraint that keeps tones from wandering in unrestrained fashion. It depends on the notion of sponsorship. A morpheme "sponsors" a tone if that morpheme includes that tone in its lexical entry. The constraint is ALIGN-TO-SPONSOR:

(20) ALIGN-TO-SPONSOR - the leftmost of the tones sponsored by a morpheme is associated to the leftmost TBU which includes that morpheme.[8]

This constraint keeps lexical tones associated to the morphemes sponsoring them.[9] For example, ALIGN-TO-SPONSOR is necessary to keep a High tone on the word-final syllable of nouns ending in *-ŋ*, even if the preceding syllable is toneless, as in *kpìbíŋ* 'louse' above. Usually a morpheme will have an entire syllable at its left edge, and so the leftmost tone will associate to the leftmost syllable of that morpheme. However, if the morpheme is not an entire syllable itself, as with word-final *-ŋ*, the tone of the morpheme associates to the syllable containing the morpheme *-ŋ*, as we see both in *kpìbíŋ* and our first tableau below. In this and all following tableaus, morpheme boundaries are marked with a hyphen, not only for the segmental material, but between tones as well.

Tableau 1: tǎŋ 'stone' -- shows ALIGN-TO-SPONSOR >> *CONTOUR

UR L -H tan-ŋ	ALIGN-TO-SPONSOR	*CONTOUR
a. ☞ L H \ / taŋ		*
b. L H | taŋ	*!	
c. L H | taŋ	*!	

Above, the Low tone is sponsored by the noun stem *tan*[10] and so must associate to its sponsoring morpheme by Align-TO-SPONSOR. Likewise, the High tone is sponsored by the suffix *-ŋ* and must associate to the syllable containing its sponsoring morpheme. The ALIGN-TO-SPONSOR constraint is unviolated when both High and Low tones associate to the single TBU of the word. Since the winning candidate has a contour tone, it is evident

[8] Bickmore (1996) includes a similar constraint, citing Ham (1996): ALIGN (H,L,So,L) - The left edge of a High Tone Span must align with the left edge of its lexical source. Predating both of these is the Basic Alignment Left family of Optimal Domains Theory, aligning the left edge of some F-domain to the left edge of its sponsor (Cole & Kisseberth 1994, 1995, and other ODT literature).

[9] ALIGN-TO-SPONSOR has some properties in common with the traditional left-to-right mapping in autosegmental phonology. It maps the leftmost tone to the leftmost TBU. However, it says nothing about where the second tone in a sequence should be mapped. Furthermore, it specifically targets morphemes, whereas the usual autosegmental mapping targeted words. In this way, it somewhat resembles the tone to TBU mapping scheme in Lexical Phonology, in which tones were associated to morphemes before bracket erasure between morphemes occurred.

[10] The actual stem is *tan*, as seen in the plural *tan-a*. But when the suffix *-ŋ* is added to *tan*, the result is *taŋ*.

that ALIGN-TO-SPONSOR outranks *CONTOUR. In candidate (b), the High tone is not associated to the syllable *taŋ* containing its sponsoring morpheme *ta-*, and in candidate (c), the Low tone is not associated to the syllable *taŋ* containing its sponsoring morpheme *-ŋ*.

The constraints *(H) and *(L) are both violated above in the losing candidates, and could in themselves force the acceptance of the winning candidate, but there is no way to tell from *tǎŋ* what ranking they should have with respect to each other or with respect to *CONTOUR. Other data discussed in Cahill (1997) shows that *(H) is undominated; an underlying floating High tone is always associated. However, ALIGN-TO-SPONSOR can be violated.

3.2 More complex cases - prohibition against HLH

In Kɔnni words, there is never a phonetic HLH (¯ _ ¯) sequence within words. Rather, when morphemes that would have produced such a sequence concatenate, the result is H!HH (¯ - -).

One plausible reason for this can be traced to the nature of communication. A language must have "texture" to it, a variation in whatever parameters are relevant, in order to communicate any information at all. However, these parameters must not vary so rapidly that it presents excessive difficulty either in parsing the information present, or producing the necessary articulations. In a tonal language, this implies avoidance of two extremes, both a totally "flat" pitch extending over some domain, and too rapid an alternation between Highs and Lows. Either situation depicted graphically below is not desirable.

(21) a. _____

b. ¯ ¯ ¯ ¯ ¯
_ _ _ _

This situation translates into two types of constraints in OT. A constant Low-tone such as in (21a) is prohibited in Kɔnni by a constraint requiring at least one High tone per word, to be discussed below.[11] (21b), a constant alternation between High and Low tones, is shown to be prohibited in Kɔnni by the fact that there is rarely a HLH sequence on TBU's (e.g. see (10-11)).

[11] Interestingly, Kɔnni freely allows words and utterances with all High tones, but not with all Low tones. This asymmetry with respect to Highs and Lows is possibly related to the salience of High vs. Low, but a full discussion of this is beyond the scope of this paper.

(22) *HLH = no Low can be associated when between two High tones: * H L H
                                                                                    |
                                                                                    X

The citation form of the constraint, *HLH, is shorthand for the fuller representation of the forbidden configuration at the right of (22) above. The precise form of this constraint is proposed tentatively; there may be another configuration that would be as adequate.

The absence of a constraint symmetric to *HLH is notable, i.e. there seems to be no *LHL cross-linguistically; on the contrary, there are many instances in which one syllable is prominent (i.e. accented or high-toned) and is surrounded by non-prominent ones. Speculatively, this could be due to the greater salience of peaks relative to valleys.

As mentioned, the result of concatenating morphemes with HLH tones is H!HH, not HH!H. In the output, it is the rightmost High which has spread left.[12] Most spreading in Kɔnni is from right to left.[13] A constraint against rightward spreading is evidently active.

(23) *R-SPREAD - a tone cannot be associated both to its sponsoring TBU and to a TBU to its right.

This constraint depends, of course, on being able to correctly identify the sponsoring TBU of a particular tone. As we shall see below, this presents no problem. A language may have a predominant direction of tone spreading, and in such a language, either *R-SPREAD or the complementary *L-SPREAD would be highly ranked.

The constraint mentioned in the introductory section 3.1 against spreading must be mentioned at this point as well, that is, *H-SPREAD, which prohibits any spreading of a High tone. Since the High here is multiply linked, then *H-SPREAD must be ranked below *HLH.

[12] In Cahill (1992) I proposed another High-Spreading rule applying across word boundaries, but it now appears that the data actually may all be covered by spreading High in the HLH environment.

[13] There are two known cases where a tone does spread rightward. One is from a noun onto the toneless locative particle ma/me 'on/in/at', which assumes the tone of the noun to the left, e.g.:

tígírí mé	'in the house'	gbɪ̀ŋkpɪ̀ám má	'on shoulder'
lórikè mè	'on the lorry'	kóŋkɔ̀m mà	'in tin can'

Note that the High here spreads onto a toneless TBU and is thus distinguished from the spreading of High onto a TBU which sponsors a Low tone, which is leftward in Kɔnni. The second case is an apparent rightward spreading in some noun-adjective complexes, which I have not investigated fully. These show that *R-SPREAD may be violated in at least some cases , and so I do not show it in tableaus as undominated.

Tableau 2: ná!pɔ́ríŋ 'calf (leg)' shows *HLH, *R-SPREAD >> *H-SPREAD, *(L)

UR H L- H napɔrɪ-ŋ	*HLH	*R-SPREAD	*H-SPREAD	*(L)
☞ H L H | / a. napɔrɪŋ			*	*
H L H | \ | b. napɔrɪŋ		*!	*	*
H L H | | | c. napɔrɪŋ	*!			

I follow here the convention of putting a dotted line between contraints whose ranking with respect to each other cannot be determined.

Candidate (c), though perfectly satisfying a one-to-one matching between tones and TBU's, is nevertheless rejected because it violates *HLH. Candidate (b) is rejected because the spreading of High is rightward, leaving candidate (a) as optimal. Note that the High tones and their respective sponsors are readily identifiable.

3.3 The disyllabic nouns - MAX and DEP constraints

Now we are in a position to evaluate the disyllabic nouns and see in particular how four different underlying representations can give rise to one surface citation form of LH. In Cahill (1997), I examine all four disyllabic noun patterns which are LH in citation form, both in the associative construction and in citation form. Below I will limit myself to forms which illustrate the interaction of constraints relevant to the analysis of the polar suffix of noun class 1. The MAX and Dep family of constraints, not discussed up to this point, will be essential as we consider toneless nouns, though some patterns are analyzable within the constraints already established.

The MAX and DEP family of constraints is well-established in Correspondence Theory (e.g. McCarthy & Prince 1995 and others in the same volume). In the foundational paper on Correspondence Theory (McCarthy & Prince 1995), MAX and DEP were defined with respect to segments, i.e. speech sounds such as vowels and consonants:

(24) MAX family - every segment of S_1 has a correspondent in S_2 (prohibits deletion)
DEP family - every segment of S_2 has a correspondent in S_1 (prohibits insertion)

The MAX and DEP family have also been used with entities other than segments, e.g. moras (Itô, Kitagawa, & Mester 1995). Also, with the recognition of tones as autosegments, that is, entities which may be deleted or inserted independently of any segmental or other featural material, we can apply these constraints to tones, as indeed Myers & Carleton 1996 have already done. The constraints used here will be specifically:

(25) MAX-IO (T) - every tone of the input has a correspondent in the output (prohibits deletion)
DEP-IO (T) - every tone of the output has a correspondent in the input (prohibits insertion)

These will hereafter be referred to by the abbreviated forms MAX (T) and DEP (T). Note that a tone may be floating in either input or output and be counted as present, i.e. if a tone which is associated in the input is floating in the output, it has not been deleted and does not violate Max (T). Even floating tones may have phonetic effects: a floating Low will cause downstep, and a floating High can associate in some contexts even if not in all.

Since a tone may be either High or Low in Kɔnni, the constraints above are actually families and can be split into MAX (H) and MAX (L), DEP (H) and DEP (L) below, since the High and Low tone constraints may have separate rankings.[14] For the DEP family, they must have separate rankings. Likewise, there is likely a difference in the deletion of High and Low tone, but for the data in this paper no specific reference to MAX (L) is made, and in this paper I will refer only to MAX (T).

These MAX and DEP constraints are essential to understanding how a LH citation tone on a disyllabic noun can actually arise one of four different ways, and we now examine these.

The noun *hɔ̀gû* 'woman' is posited to be toneless underlyingly (the LH in citation form will be discussed below). In *ò hɔ́gù* 'his woman,' a High tone is from the associative morpheme (see Sec. 2.2). The tableau below refers to the constraint *TONELESS for the first time; this constraint rules against any form which has no tone associated to a TBU. Since there are not any surface toneless TBU's in Kɔnni, *TONELESS is undominated.

[14] Note that the parentheses around the constraints *(H) and *(L) indicate floating tones, but the parentheses in the MAX and DEP constraints are used merely as separators.

Tableau 3: ù hógù 'his woman' shows *TONELESS, H-SPREAD, DEP (H) >> DEP (L)

UR	L H ʊ ASSOC hɔgʊ	*TONELESS	*(H)	*H-SPREAD	DEP (H)	DEP (L)
☞ a.	L H L | | | ʊ hɔgʊ					*
b.	L H H \ \ / ʊ hɔgʊ				*!	
c.	L H | /\ ʊ hɔgʊ			*!		
d.	L H L | /\ ʊ hɔgʊ		*!			*
e.	L H | | ʊ hɔgʊ	*!				

With no underlying tones in *hɔ̀gʊ*, all surface tones are inserted . Here and in cases below, a toneless TBU receives a Low tone as default. This involves a violation of DEP (L). But this case shows that the Kɔnni speaker would rather insert a Low than spread a non-lexically sponsored High or insert another High. Also, note that spreading the High to a toneless adjacent syllable is not an option, and is ruled out by *H-SPREAD.

Neither of the nouns *kàgbá* 'hat' nor *hɔ̀gú* 'woman' has an underlying High tone present in the forms I have posited, yet they both in citation form have a High tone on the second syllable. As previously mentioned, no noun in citation form is all Low toned, whatever the number of syllables. There is always at least one High present. in some contexts *kagba* is pronounced with all Low tones, as in *kàgbà kàànɨ́* 'one hat' or *ŋ̀ wó kàgbà* 'I lack hat.' In these cases, related to the discussion about the tonal texture of an utterance in Sec. 3.2, we see that in Kɔnni, the utterance has a High tone elsewhere. In the citation forms, if there is no High in underlying representation, one is inserted. This is the only situation where High-insertion takes place in Kɔnni.

This relates to similar phenomena in other languages. In several genetically and geographically diverse languages, there is a prohibition against a word having only Low tones. In Mixtec of San Miguel El Grande, in Mexico (Goldsmith 1990, from data in Pike 1948), no words are all Low-toned. The Moore and Dagaare languages of West Africa have a similar pattern: in disyllabic nouns, HH, HL, and LH are attested, but not LL (Kenstowicz, Nikiema, & Ourso 1988, Antilla & Bodomo 1996). Finally, a similar

constraint STEMH (all stems must contain a H-tone) is proposed for North Kyungsang Korean (Kim 1997). In all these languages a "flat" texture of Lows is not tolerated.

The relevant constraint in Kɔnni needs more investigation as to its precise formulation; in particular, what exactly is the domain that requires a High tone? For the present, and knowing that its domain may need revision, I propose the following undominated constraint:

(26) H-PRESENT - there must be at least one High tone present in an utterance.

The tableau below shows the activity of H-PRESENT with other constraints, as well as the first appearance of the DEP(H) constraint.

Tableau 4: kàgbá 'hat' H-PRESENT >> DEP(H)

UR L kagba	H-PRESENT	ALIGN-TO-SPONSOR	DEP(H)	DEP(L)
L H ☞ | | a. kagba			*	
H L | | b. kagba		*!	*	
L L | | c. kagba	*!			*
L | \ d. kagba	*!			

Since a High tone is inserted, here DEP(H) is violated and must therefore be outranked by other constraints which rule out the alternative candidates below. The word *kàgbá* is posited to have a Low tone since there is always a Low present in some position in the word in all contexts (see Appendix 1), unlike the roots I have posited as toneless.

3.4 The polar plural suffix of Noun Class 1

In this section I show that the tonal behavior of the class 1 plural suffix in Kɔnni can best be accounted for by a constraint POLAR, specific to that morpheme. After reviewing the Kɔnni data, I will specifically show how POLAR accounts for all the forms, then examine two other researchers' approaches to "polar" suffixes, and other possible solutions within the system proposed thus far in this paper.

In previous studies of nouns in Gur languages, it has been noted that in many nouns, the nominal suffix has a tone opposite to that of the noun stem. In Moore, for example, disyllabic nouns have one of the patterns LH, HL, or HH (but never LL). Kenstowicz, Nikiema, and Ourso (1988) analyze this and a similar pattern in Lama as all suffixes having a High lexical tone, with the stems being either High, Low, or toneless. A /L-H/ sequence is unchanged, a /H-H/ sequence changes to HL by a version of Meeusen's dissimilation rule, and /Ø-H/ changes to [H-H] as a result of spreading the only High tone present. So in Kenstowicz *et al's* analysis of Moore, the apparent tonal polarity is the result of other processes. Hyman (1993) proposes a similar analysis for Dagbani as well.

In Kɔnni, most suffixes on nouns in Kɔnni are High-toned. In contrast to Moore, this is shown by the fact that these suffixes do *not* alternate or show any polarity, but consistently show up as High-toned. However, the plurals of Noun Class 1 (NC1) in Kɔnni behave in a way inconsistent with the other unambiguously High-toned suffixes. These are exemplified by the forms below, repeated in Appendix 2. The suffix on the plural form is either *-a* or *-e*, depending on vowel harmony, and this suffix is *not* consistently High-toned, but surfaces with a tone opposite to the previous stem tone.

(27)

singular	plural	stem tone	pl.suffix tone	gloss
tǎŋ	tàná	L	H	'stone/s'
síŋ	síà	H	L	'fish/es (sp.)'
bɪ̀ɪ̀síŋ	bɪ̀ɪ̀sá	L	H	'breast/s'
tígíŋ	tígè	H	L	'house/s'
sɪ̀kpááŋ	sɪ̀kpárà	LH	L	'heart/s'

There are also noun stems with HL tone. Since these add an additional complication, discussion will be deferred until later.

A satisfactory approach in terms of the Optimality Theory worldview comes when we note that the tone of the plural suffix is opposite to the one before. This is true in a wide variety of cases, whether there is an inserted tone on the suffix, the NC1 plural suffix tone is spread, whether the last tone of the word is an underlying tone of the root, or whether the polar tone is floating, all of which will be exemplified below. We propose a constraint POLAR to describe this generalization.

(28) POLAR: when a noun class 1 plural suffix is present, there is a tone immediately following the final stem tone which is opposite in polarity to that stem tone.

This constraint refers to the tonal tier, and describes the presence of a tone adjacent and to the right of a stem tone. If such a tone is not present in the input, it will be inserted, from the interaction of POLAR and other constraints. However, if the input

already satisfies POLAR, no insertion occurs. I first illustrate POLAR with the NC1 plural *sîà* 'fishes'. In the tableaus below, Ø is not meant as a formal entity, but merely to indicate the lack of a sponsored tone for the indicated segmental morpheme.

Tableau 5: sîà 'fishes' POLAR >> *CONTOUR

UR H-Ø sɪ-a	POLAR	*CONTOUR	DEP (H)	DEP (L)
☞ H L | / a. sɪa		*		*
H | b. sɪa	*!			
H H | / c. sɪa	*!	*	*	
L H | / d. sɪa	*!	*		*

Recall that the syllable, here the diphthong *ɪa*, is the TBU in Kɔnni, and in word-final position, it can bear a contour tone. Candidate (a) wins, though it violates DEP(L) by inserting a Low tone, and violates *CONTOUR by having a contour tone. Since *sîà* is a NC1 plural, POLAR applies, and candidates (b) and (c) fatally violate it, since there is no polar tone present. Here, POLAR is satisfied by the insertion of a Low tone. Candidate (d) fatally violates POLAR because the polar tone does not follow the stem tone, but precedes it.

Similarly, with *jòá* 'tails', POLAR is satisfied by inserting a High tone.

Tableau 6: jùá 'tails'

UR L-Ø ju-a	POLAR	*CONTOUR	DEP (H)	DEP (L)
☞ L H | / a. jua		*		*
L L | | b. jua	*!		*	
L | c. jua.	*!			
H L | / d. jua	*!	*		*

In both *tàn-á* 'stones' and *tàn-á-há* 'the stones', POLAR forces the *-a* suffix to have a High tone. Interestingly, while in *tàn-á* the High tone is clearly an inserted one, in *tàn-á-há*, the High on *-á* may have its source in either insertion or from spreading from the High on *-há*. We first present the tableau for *tàn-á* 'stones.'

Tableau 7: tàná 'stones' shows POLAR >> DEP(H)

UR L-Ø tan-a	*TONELESS	POLAR	DEP(H)	DEP(L)
☞ L H | | a. tana			*	
L L | | b. tana		*!		*
L | \ c. tana		*!		
L | d. tana	*!	*		

The winning candidate (a) avoids a violation of POLAR by inserting a High tone, showing POLAR outranks DEP(H). Candidates (b, c, d) all violate POLAR and are ruled

out. Candidate (d) is ruled out not by its violation of POLAR, but by a violation of *TONELESS. As we shall see later, it is possible for POLAR to be violated, but *TONELESS never is. POLAR is thus highly-ranked, but not top-ranked.

In *tàn-á-há* 'the stones', the High tone on *-á* could conceivably have a source either in an inserted tone or in spreading from the definite suffix *-há*, as illustrated below.

Tableau 8: tàn-á-há 'the stones'

UR L-Ø-H tan-a-ha	POLAR	*H-SPREAD	DEP (H)	DEP (L)
☞ L H H | | | a. tanaha			*	
☞ L H | /| b. tanaha		*		
L L H | | | c. tanaha	*!			*
L H |\ | d. tanaha	*!			

Above, I mark both candidates (a) and (b) as winning, since at this time there is no way to distinguish which is actually the winner.[15] Candidates (c, d) are clearly losers in that they both fatally violate POLAR. However, we have not established a ranking between *H-SPREAD and DEP (H) in this work. Empirically, this is difficult to establish, since a multiply-linked single High and two Highs are phonetically indistinguishable This is unfortunate, since they are the very constraints that would decide between candidates (a) and (b). The issue amounts to whether it is better to spread a High onto an empty TBU or insert a new High. The only cases of High insertion we have seen in Kɔnni involve words which have no underlying High, and it is quite possible that High insertion is indeed limited to those. However, at this point, I have no clear empirical evidence to decide the ranking, and at this point, we must live with the indeterminacy.

The tableau for *jágâ* 'shades', however, is unambiguous:

[15] In approaches which do not concern themselves with association lines, such as Bickmore 1996, or as in Optimal Domains Theory, which explicitly denies association lines, this distinction is a non-issue.

Tableau 9: jágâ 'shades' shows POLAR >> DEP (L)

UR HH-Ø jag-a	POLAR	MAX (T)	*CONTOUR	DEP (L)
☞ H HL | |/ a. jaga			*	*
H L | | b. jaga		*!		*
H H | | c. jaga	*!			

In *jágâ*, the winning candidate (a) satisfies POLAR without violating MAX (T). Candidate (b) also satisfies POLAR, but incurs a fatal violation of MAX (T) by deleting the second underlying High tone. Candidate (c) does not satisfy POLAR and is therefore ruled out. The word *bítíè* 'chins' as well as others are also accounted for by this approach.

An inserted polar tone is not always associated, as shown by the analysis of *bʊ̃̃ll5́gáhá* 'the bags.' The floating Low that is indicated by downstep is associated in the indefinite form *bʊ̃̃ll5́gà* 'bags.' In the indefinite form, there are simply two High tones in the stem, and the Low on the suffix *-à* is inserted to conform to POLAR. In the definite plural form, a Low is also inserted, but it remains floating:

Tableau 10: *bʊ̃̃ll5́gáhá* 'the bags

UR HH-Ø-H bʊllɔg-a-ha	*HLH	POLAR	*RT-SPREAD	DEP (L)
☞ H H L H | | /| a. bʊllɔgaha				*
H H L H | | | | b. bʊllɔgaha	*!			*
H H L H | |\ | c. bʊllɔgaha			*!	*
H H H | | /| d. bʊllɔgaha		*!		

Candidates (a-c) all have the inserted Low tone after the stem High and thus do not violate POLAR, as does candidate (d). Candidate (b) is ruled out by a fatal violation of

*HLH, since the Low is associated between two High tones. Candidate (c) is ruled out by a violation of *RT-SPREAD (recall from the discussion in Sec. 3.2 that a /HLH/ sequence in Kɔnni is pronounced [H!HH], as in Tableau 2).

In some words, the polar tone inserted for the indefinite plural form does not surface at all in the definite plural form. In forms like *sìsìé* 'grasscutter' (a groundhog-like animal), the plural suffix *-é* has the expected polar High tone. However, in *sìsìèhé* 'the grasscutters,' the plural suffix does not manifest a High. This falls out from the constraints posited thus far.

Tableau 11: sìsìèhé 'the grasscutters

UR LL-Ø-H sisi-e-he	POLAR	*CONTOUR	MAX(T)	DEP (H)
☞ L L H | | | a. sisiehe				
L L H H | | / / b. sisiehe		*!		*
L H | / | c. sisiehe			*!	

Thus far, either an inserted polar tone or one which is spread from another suffix account for all forms. However, the set of words like *yíímà* 'arrows' illustrates a case in which neither insertion nor spreading is operative. The citation and definite singular forms *yí!íŋ* 'arrow', *yíí!rí* 'the arrow' show by the downstep that the root *yɪɪ* must have a HL underlying tone. But this is exactly the tone that appears on the plural form *yíímà*.. The Low tone on the suffix is also present in the input. If there were an *inserted* polar tone, it would be High in this case to contrast with the final Low in the root, and we would expect that final Low to float, giving the unattested result **yíí!má*, which is what we expect given the formulation of the constraints above.

At this point I do not have a clear-cut account of *yíímà*. However, two possible solutions come with a closer consideration of the POLAR constraint. The function of POLAR is to give a contrast between the last root tone and the tone of the NC1 plural suffix. If the two final tones in the word are High and downstepped High, this provides less of a contrast than a High and a Low, subverting the purpose of the POLAR constraint. One possibility is that the POLAR constraint could be reformulated in such a way as to embody this notion that the contrast of tone in the suffix should be maximal. In this formulation, then **yíí!má* would not satisfy POLAR, but *yíímà* would. The second possibility is that POLAR could be reformulated in such a way that both *yíí!má* and *yíímà* do satisfy the constraint. The surface tone of the suffix contrasts with that of the tone

borne by the noun stem in both cases. In this schema, the crucial difference between the two is that **yíf'má* has an additional High tone, which fatally violates DEP(H). Tableaus illustrating both of these possible reformulations of POLAR are given below.

Tableau 12: *yífmà* 'arrows', assuming POLAR → "suffix has maximal contrast from stem"

UR HL-Ø yɪɪm-a	*HLH	POLAR	*CONTOUR	DEP (H)
☞ H L | | a. yɪɪma				
H L H | / b. yɪɪma		*!		*

Tableau 13: *yífmà* 'arrows', assuming POLAR → "suffix has different pitch than stem"

UR HL-Ø yɪɪm-a	*HLH	POLAR	*CONTOUR	DEP (H)
☞ H L | | a. yɪɪma				
H L H | / b. yɪɪma				*!

3.4.2 Alternatives

Here I will briefly review a number of alternative analyses which do not use the constraint POLAR (though assuming the other constraints in this paper), and show that they do not account for the data as well as the analysis proposed above.

The general Moore analysis using lexical High tones and an OCP-driven dissimilation for all suffixes cannot be applied to Kɔnni; there would have to be a rule or constraint *specific* to the class 1 plural. As shown, the *-ŋ* singular suffix is High-toned. If the plural suffix *-a/-e* is also High, we would expect the same tonal patterns in the singular as in the plural, but instead we find two distinct patterns in singular and plural forms, e.g. *wíŋ* 'face mark' and *wíè* 'face marks.' The singular always ends in a High tone, but the plural ends in a tone opposite to the last tone of the noun stem. Furthermore, the plurals of noun class 1 are the only ones which act in this manner. Positing a lexical

High tone with no other stipulations to account for these is unworkable, since this would lead to the same behavior as the other suffixes, which are definitely High-toned.

While the Kɔnni class 1 plural suffix cannot be lexically High-toned, perhaps it could be underlyingly Low, since the suffix often surfaces as Low. However, this will not work within the system of constraints discussed thus far. If the suffix is Low, it would change to High after a Low-stemmed noun, because a High tone is necessary in a word (expressed by the constraint H-PRESENT). So *tànà* 'stones' would have lexical tones /tàn-à/ and the lexical Low on the second syllable would be High in the output to avoid violating H-PRESENT. (This ignores the question of why the High is manifested on the second rather than the first syllable.) However, this scenario runs into problems in the case of words like *tànáhá* 'the stones.' This word is divided into morphemes as *tàn-á-há*. If the suffix *-a* is underlyingly Low-toned, there is no motivation for it to change to High in this word, since a High is already present in *-há*. A Low tone for the "polar" suffix in the general system proposed thus far is therefore unsupported.

In the present system of constraints, then, neither High nor Low is possible. The last representation-based solution available is that the suffixes of noun class 1 in Kɔnni are toneless. Antilla and Bodomo (1996), hereafter A&B, discuss a polarity phenomenon in Dagaare very similar to that of Moore. In contrast to the Moore analysis by Kenstowicz *et al*, in A&B's account, all nominal suffixes in Dagaare are analyzed as underlyingly toneless. For disyllabic nouns, Dagaare has the same tone patterns as Moore did: LH, HL, and HH. If the root is toneless, A&B's analysis inserts a default H, which spreads to both syllables, giving surface HH. If the root has a lexical tone, the OCP, acting as a specific constraint, ensures that the inserted tone is not identical to the root tone but is opposite, giving surface LH and HL. It may be possible to re-analyze Moore in the same way, with toneless suffixes. Kenstowicz *et al* (1988) rejected the insertion of High tones for Moore on the grounds that the default in a Low-High tonal system is typically Low, not High. However, it is not unknown to have High tone as default; Clark (1990) and Creissels & Grégoire (1993) have analyzed Igbo and Manding, respectively, as having a High tone as the default, though High default does still seem to be the less common case.

Unlike A&B's account of Dagaare, the Low tone has been shown to be the default in Kɔnni (Cahill 1997). But a variation of the A&B tone insertion solution for Dagaare's toneless suffixes could account for most forms in Kɔnni. In this variation, a High is inserted only when the noun otherwise lacks any High. The same set of constraints in both tableaus below will yield either a High or Low inserted, depending on the context.

Tableau 14: tàná 'stones'

UR L-Ø tan-a	*TONELESS	H-PRESENT	*RSPREAD	DEP (H)	DEP (L)
☞ L H | | a. tana				*	
L L | | b. tana		*!			*
L | \ c. tana		*!	*		
L | d. tana	*!	*!			

Tableau 15: tígè 'houses'

UR H-Ø tig-e	*TONELESS	H-PRESENT	*RSPREAD	DEP (H)	DEP (L)
☞ H L | | a. tige					*
H H | b. tige				*!	
H |\ c. tige			*!		
H | d. tige	*!				

Above, when two equally-ranked (or at least indeterminately-ranked) constraints would each by itself rule out a particular candidate, I mark both with the (!) that marks a fatal violation.

If the noun stem is Low, as in *tàná* 'stones' in Tableau 13, the normal default Low is ruled out, and a High must be inserted, since a noun must have a High tone present somewhere. If the noun stem is High, as in *tígè* 'houses' in Tableau 14, then the default Low supplies the tone for the second syllable, with other possible candidates ruled out by the constraints as shown. So we see that in the cases above, the polar suffix is analyzable

as a result of constraints already noted as active in other tonal phenomena, if the suffix is posited as toneless.

The same analysis works for longer words as well. Relevant cases would include *bʊ̀llɔ́gà* 'bags' and *dàmpàlá* 'bench (lit. *logs*). In *bʊ̀llɔ́gà*, a Low is inserted on the toneless suffix as the normal default, and in *dàmpàlá*, a High is inserted in order to satisfy the requirements of H-PRESENT.

There are at least two sets of data, however, which are problematic for this analysis and will be examined below. The first set is forms like the previously-mentioned *tàn-á-há* 'the stones,' in which there seems to be no motivation from H-PRESENT to insert a High tone on a plural suffix *-a*, since the word already has a High tone in it from *-há*. the constraint *H-SPREAD has been established as ranked above DEP(L), so from these *tànàhá* would be predicted rather than the correct *tánáhá*.

The second set is words like *jágâ* 'shades.' The word *jágâ* was shown in Sec. 2.5 to have two lexical High tones, with the second High combined with a Low to make a falling tone on the second syllable. This is tonally similar to *sîà* 'fishes (sp.)' from (27), in that these both have falling tones on the last TBU of the word.' Here, there is no motivation to insert a tone on a toneless suffix from *TONELESS, since the final TBU would already have a tone available. Also, the constraint *CONTOUR would be violated. Here the constraints in place would predict the incorrect *jágá*.

Other possibilities can be imagined to account for the facts, such as positing the class 1 suffix to be either High- or Low-toned, and then a version of the OCP which is restricted to the class 1 suffix, ensuring the correct output. However, we have seen the OCP is in general not active in Kɔnni, and without further evidence there is no reason to invoke a specific instantiation of it here. Also, this approach would miss the clear surface generalization on polarity expressed by POLAR above.

Whatever the crucial constraint that accounts for the noun class 1 plural tone, it is clear that it will have to refer to this one specific morpheme, the noun class 1 plural in Kɔnni. This is consistent with the claim in Anderson (1974) that all polarity rules (termed "exchange rules" there) are either morphologically or lexically restricted, and with Schuh's (1978) observation that all tone polarity rules known to him are marked for specific morphemes, rather than being a part of the general phonology. Thus this is a clear case of a constraint being language-specific, with no possibility of being universal.

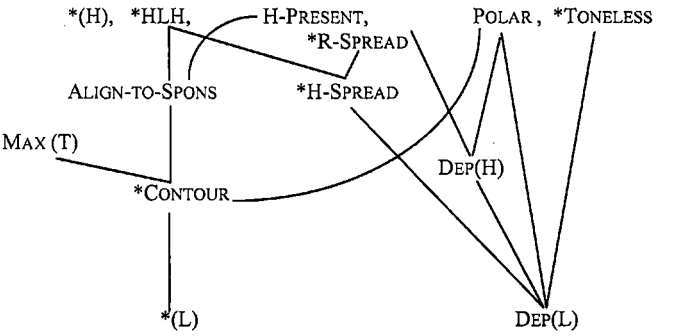
Interestingly, the Dagaare, the Moore and the Dagbani analyses all rely on the OCP as the crucial factor in accounting for apparent tonal polarity. In Dagaare, Antilla & Bodomo are explicit that the OCP is a constraint *preventing* two like tones from occurring on the surface. In Moore and Dagbani, the driving force for the Meeusen's Rule *changing* a HH to a HL is implicitly the OCP. However, in Kɔnni, as we have seen, the

OCP is unnecessary to account for tonal polarity or any other tonal phenomena, and it is possible that these other Gur languages could profitably be re-analyzed without recourse to the OCP. It certainly seems that the Meeusen's Rule/OCP analysis may be a carryover from analyzing Bantu languages in which it definitely does play a major role.

4. Summary

The constraints mentioned in this paper and their relative rankings are shown below. Though not all constraints can be specifically ranked with respect to each other, there are no ranking paradoxes present. It will be noted that quite a few of the constraints are undominated. This could be an artifact of the data analyzed, of course, and with more data, some of these might be demoted to lower rankings. But as far as I know, all these express generalizations in Konni tone which are exceptionless.

(29)



An Optimality Theory account is most clearly a natural one when the phenomenon under consideration is a "conspiracy," in which a surface generalization may be generated from an underlying form in a number of different ways. One example would be a constraint that expresses CV as the preferred syllable structure. If an underlying representation is not CV, it may be manifested as a surface CV by any of several means, such as deletion, epenthesis, glide formation, etc. In a similar fashion, the Konni constraint POLAR is an expression of a singular surface generalization. However, this generalization may be generalized from an underlying representation in at least two, and likely three independent paths. In *yĭ̀mà* 'arrows', the polar tone is also an underlying tone and there is no change. In *jágâ* 'shades' as well as many other nouns, a polar tone must be inserted. In *tànáhá* 'the stones', it is quite likely that the polar tone comes from spreading. Thus the surface polar tone can be generated from underlying representations in several distinct ways, and this is in keeping with the spirit of Optimality Theory.

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APPENDIX 1 - Perturbation of target nouns

Only one example is given of each tone class, but if there are fewer than five examples in my data, the number is marked. Nouns are given in citation forms as well as in frames, and the postulated underlying tone of each noun is listed as well as the surface tone.

The frames	'this is X' 'I lack X'	'one X' 'his/her X'
One-Syllable Nouns		
1. súŋ 'broom'	súŋ wún!ná ŋ̀ wó súŋ	súŋ !káání ò súŋ
2. tăŋ 'stone'	tăŋ wún!ná ŋ̀ wó !táŋ	tăŋ !káání ò tá!ŋ̀ (H-!H on single syllable)
3. bʊ̀á 'child' (4)	bʊ̀á wún!ná ŋ̀ wó !búá	bʊ̀á !káání ò búà
Two-Syllable Nouns		
1. jórɔ́ŋ 'ladder'	jórɔ́ŋ wún!ná ŋ̀ wó jórɔ́ŋ	jórɔ́ŋ !káání ò jórɔ́ŋ
2. hɔ̀gú 'woman'	hɔ̀gú wún!ná ŋ̀ wó !hógú	hɔ̀gú !káání ò hógù
3. kpìbíŋ 'louse'	kpìbíŋ wún!ná ŋ̀ wó !kpíbíŋ	kpìbíŋ !káání ù kpíbíŋ
4. zàsíŋ 'fish'	zàsíŋ wún!ná ŋ̀ wó !zásíŋ	zàsíŋ !káání ò zá!síŋ
5. kàgbá 'hat' (3 examples)	kàgbá wún!ná ŋ̀ wó kàgbà	kàgbà kàání ò kágbà
6. náá!gíŋ 'cow'	náá!gíŋ !wún!ná ŋ̀ wó náá!gíŋ	náá!gíŋ kàání ò náá!gíŋ
7. tá!síŋ 'headpan' (3 examples)	tá!síŋ wún!ná ŋ̀ wó tá!síŋ	tá!síŋ !káání ò tá!síŋ
8. máásà 'a cake' (2 examples)	máá!sá wún!ná ŋ̀ wó máásà	máásà kàání ò máásà
9. nʼmbúà 'sibling' (1 example)	nʼmbú!á wún!ná ŋ̀ wó !nímbúà	nʼmbúà kàání ò nímbúà

Three-Syllable Nouns

1. wásígá 'dried porridge'	wásígá wún!ná ŋ̀ wó wásígá	wásígá !káání ù wásígá
2. bùrìmíŋ 'bush donkey' (4 examples)	bùrìmíŋ wún!ná ŋ̀ wó !búrímíŋ	bùrìmíŋ !káání ù bú!rímíŋ
3. dàmpàlá 'bench'	dàmpàlá wún!ná ŋ̀ wó dàmpàlá	dàmpàlá !káání ù dám!pálá
4. kùkwábíŋ 'feather'	kùkwábíŋ wún!ná ŋ̀ wó !kúkwábíŋ	kùkwábíŋ !káání ù kúkwábíŋ
5. ná!póríŋ 'calf (leg)' (4 examples)	ná!póríŋ wún!ná ŋ̀ wó ná!póríŋ	ná!póríŋ !káání ù ná!póríŋ
6. kúrúbâ 'pot' (4 examples)	kúrúbá !wún!ná ŋ̀ wó kúrúbâ	kúrúbá kàání ù kúrúbâ
7. tányéé!líŋ 'ash' (2 examples)	tányéé!líŋ !wún!ná ŋ̀ wó tányéé!líŋ	tányéé!líŋ kàání ù tányéé!líŋ
8. kàréntìà 'cutlass'	kàrén!tíá wún!ná ŋ̀ wó !kárénţìà	kàréntìà kàání ù kárénţìà
9. kálaŋgbí!áŋ 'mussel' (1 example)	kálaŋgbí!áŋ !wún!ná ŋ̀ wó kálaŋgbí!áŋ	kálaŋgbí!áŋ kàání ù kálaŋgbí!áŋ

Four-Syllable Nouns

1. àlìbélsà 'onion'	àlìbél!sá wún!ná ŋ̀ wó àlìbélsà	àlìbélsà kàání ù á!líbélsà
2. kàmbùntáá!míŋ 'pawpaw' (1 example) (lit. 'Ashanti sheanut')	kàmbùntáá!míŋ wún!ná ŋ̀ wó kàmbùntáá!míŋ	kàmbùntáá!míŋ kàání ù kám!búntáá!míŋ

APPENDIX 2 - Nouns, plurals, and definite articles

There are occasional gaps in the data. I have left these as is, though in most cases the pattern is clear enough so the missing data could easily be predicted.

Nouns	Singular	Sg.+ Art	Plural	Pl.+ Art
NOUN CLASS 1				
bag	búllɔ́gíŋ	búllɔ́gírí	búllɔ́gà	búllɔ́ˡgáhá
bee	síébíŋ	síébírí	síébíè	síébíéˡhé
breast	bɪ̀ɪ̀sírŋ	bɪ̀ɪ̀sɪ̀rí	bɪ̀ɪ̀sá	bɪ̀ɪ̀sáhá
chest	nyúúŋ	nyúúrí	nyúrà	nyúˡráhá
chin	bítíéŋ	bítíérí	bítíè	bítíéˡhé
day	ḍàáŋ	dààrí	dàrá	dàráhá
face mark	wíŋ	winní	wíè	wíéˡhé
fish (sp.)	síŋ	sínní	sía	síáˡhá
forehead	dííŋ	díírí	díè	díéˡhé
gecko	chúúˡsíŋ	chúúsíˡrí	chúúsà	chúúˡsáhá
gr.stone	nííŋ	níírí	níà	níáˡhá
heart	sɪ̀kpááŋ	sɪ̀kpáárí	sɪ̀kpárà	sɪ̀kpáˡráhá
hoe	kùúŋ	kùùrí	kùrá	kùráhá
house	tígíŋ	tígírí	tígè	tíˡgéhé
knee	dŭŋ	dùnní	dùné	dùnéhé
log	dàmpàlí	dàmpàllí	dàmpàlá	dàmpàláhá
nail, arrow	yíˡíŋ	yííˡrí	yíímà	yííˡmáhá
name	sàáŋ	sàárí	sàrá	sàráhá
occiput	kpàáŋ	kpàárí	kpàrá	kpàráhá
problem	wííŋ	wíírí	wía	wíáˡhá
river	múgúŋ	múgúrí	múgà	múˡgáhá
seed	bíŋ	bínní	bíè	bíéˡhé
shade	jágíŋ	jágírí	jágâ	jágáˡhá
sheep	yísíŋ		yísè	yíˡséhé
stone	tăŋ	tànní	tàná	tànáhá

stump	dààgbúgíŋ	dààgbúgírí	dààgbúgé	dààgbúgé!hé
toad	bùntùúŋ	bùntùùrí	bùntúrá	bùntúráhá
year	bĭŋ	bìnní	bìná	bìnáhá

NOUN CLASS 2

baboon	fááŋ	fáákú	fáátí	fáátítí
calf	ná!póríŋ	ná!póríkú		
courtyard	gbàáŋ	gbàákú	gbàátí	gbàátítí
door	gbíá!bíŋ	gbíábí!kú	gbíábítî	gbíábí!títí
farm	kúáŋ	kúákú	kúátí	kúátítí
hawk	kpíí!líŋ	kpíí!líkú	kpíí!lítí	kpíí!lítítı
inside	sŭŋ	sùkú	sùtí	sùtítí
leaf	vááŋ	váákú	váátí	váátítí
moon	chííŋ	chííkú	chítí	chítítí
path	síéŋ	síékú	síétí	
squirrel	chí!íŋ	chíí!kú		
vulture	zùúŋ	zùùkú	zùtí	zùtítí
wood	dàáŋ	dàákú	dàátí	dààtìtí
worm	gbáríáŋ	gbáríákú	gbáríátí	gbáríátítí

NOUN CLASS 3

axe	lí!áŋ	líá!ká	líásî	líá!sísí
back	kùáŋ	kùàká	kùàsí	kùàsísí
chicken	kpìáŋ	kpìàká		
cobra	jìíŋ	jììká	jììsí	jììsísí
comb	zúúchásíŋ	zúúchásíká	zúúchásá	zúúchásísí
cookpot	kúrúbâ	kúrúbá!ká		
dawadawa	dùúŋ	dùùká	dùùsí	dùùsísí
dog	gbàáŋ	gbàáká	gbààsí	
fly	nánjúŋ	nánjúká	nánjúsí	nánjúsísí
fruit (sp.)	jí!íŋ	jíí!ká	jíísî	jíí!sísí
hat	síbúbúŋ	síbúbúké	síbúbúsí	síbúbúsísí
headpan	tá!síŋ	tásí!ká	tásísî	tásí!sísí
knife	jìbíŋ	jìbìká	jìbìsí	jìbìsísí
lamp	pópólí	pópólíké	pópólsí	pópólsísí
lizard	gùrá!áŋ	gùráá!ká		

man	dèmbíŋ	dèmbìké	dèmbìsí	dèmbìsísí
mussel	kálàŋgbí!áŋ	kálàŋgbíá!ká		
person	vúóŋ	vúóké	vúósí	vúósísí
pot	gbìéŋ	gbìèké	gbìèsí	gbìèsísí
sack	bɔ̀ɔ̀rá	bɔ̀ɔ̀rìká	bɔ̀ɔ̀rìsí	bɔ̀ɔ̀rìsìsí
sleeping mat	tìáŋ	tìáká	tìàsí	tìàsísí
thigh	kpìlílíŋ	kpìlílìkú	kpìlílìsí	kpìlílìsísí
tree (sp.)	sɛ̀ŋ	sèké	sènsí	sènsísí
waist	chìáŋ	chìàká	chìàsí	chìàsísí
window	tókóró	tókóróké	tókórósí	tókórósísí

NOUN CLASS 4

alcohol	dááŋ	dáábú	dáátí	dáátítí
ash	tányéé!líŋ	tányéé!líbú		
broom	súŋ	súmbú	súntí	súntítí
flour	zúŋ	zúmbú	zúntí	zúntítí
funeral	kǔŋ	kùmbú	kùntí	kùntítí
hunger	kúŋ	kúmbú	kúntí	kúntítí
meat	nɔ̃ŋ	nɔ̀mbú	nɔ̀ntí	nɔ̀ntítí
medicine	tǐíŋ	tǐìbú	tǐìtí	tǐìtítí
net	nǐíŋ	nǐìbú	nǐìtí	nǐìtítí
oil	kpááŋ	kpáábú	kpáátí	kpáátítí
peanut	sìŋkpááŋ	sìŋkpáábú	sìŋkpáátí	sìŋkpáátítí
porridge	sàáŋ	sàábú	sàátí	sàátítí
sleep	gbí!íŋ	gbíí!bú	gbíítí	gbíí!títí
thing	jàáŋ	jàábú	nyìntí	nyìntítí
water	nyááŋ	nyáábú	nyáátí	nyáátítí
wind	bùlɔ̀gsíŋ	bùlɔ̀gsíbú		

NOUN CLASS 5

child	bùá	bùàwá	bàllí	bàllílí
father	chùá	chùàwá	chùàlíŋ	chùàlíbá
friend	zùá	zùàwá	zùá!líŋ	zùàlí!bá
husband	chǔrú	chǔrùwá	chǔrú!líŋ	chùllí!bá
woman	hɔ̀gú	hɔ̀wwá	hùáŋ	hùàbá
thief	gáárú	gáárúwá		

daughter	líà	líá!wá	lí!áŋ	
older sibling	mĩ̀	míí!wá	míí!líŋ	míílí!ba

MIXED CLASSES

goat	bìíŋ	bìikú	bié	bièhé
guineafowl	kpá!áŋ	kpáá!kó	kpíínè	kpíí!néhé
rain	nĩ̀íŋ	nĩ̀ĩ̀kó	nĩ̀á	nĩ̀áhá
room	jùóŋ	jùòkú	jùné	jùnéhé
cow	náá!gíŋ	náágí!bó	níígè	níí!géhé
horse	dùúŋ	dùùmbú	dùùné	dùùnéhé
rope	gú!úŋ	gúúm!bú	gúúnê	gúúné!hé
blindness	yĩ̀ĩ̀	yíí!kú	yíísí	yíísísí
chair	chíàŋ	chíá!kó	chíásî	chíá!sísí
antelope	yìsíŋ	yìsìké	yìsé	yìséhé